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**Airplane Flight Manual Supplement
Chelton FlightLogic EFIS**

March 10, 2003
Doc. No.150-045262

Chelton Flight Systems
P.O. Box 1012
Boise, ID 83701

**FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
Or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
For
CHELTON FLIGHTLOGIC EFIS as installed in**

Make and Model Airplane

Registration Number _____

Serial Number _____

This document serves as an Airplane Flight Manual Supplement or a Supplemental Airplane Flight Manual when the aircraft is equipped with the Chelton FlightLogic EFIS system. This document must be carried in the airplane at all times when the EFIS system is installed in accordance with Supplemental Type Certificate No. _____. The information contained in this document supplements or supersedes the information made available to the operator by the manufacturer in the form of clearly stated placards, markings, or manuals as required by CAR 3.777(b) or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the basic placards, markings, or manuals or the basic FAA approved Airplane Flight Manual.

FAA Approved: _____
Manager, Anchorage Aircraft Certification Office
Federal Aviation Administration
Anchorage, Alaska
Date: _____

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1.0 GENERAL

The Chelton Flight Systems FlightLogic EFIS equipment has been certified to TSO C-146 Class Gamma 1 and complies with AC20-138a for navigation using GPS and WAAS (within the coverage of Space-based Augmentation system complying with ICAO Annex 10) for en route, terminal area, and non-precision approach operations (including "GPS" or "GPS and RNAV" approaches).

The Chelton FlightLogic EFIS is a complete flight and navigation instrumentation system that provides information to the pilot via the Integrated Display Unit (IDU). The IDU can be configured as a Primary Flight Display (PFD), or a Multi-Function Display (MFD) depending on installation. The PFD is a three-dimensional, enhanced synthetic vision display that provides forward-looking terrain, attitude, altitude, airspeed, vertical speed, direction, and Highway-in-the-Sky navigation. The MFD can display a moving map, traffic, terrain, weather, HSI or a combination thereof.

The EFIS provides visual and aural warnings, cautions, and advisories for system monitoring. Warnings consist of a red flag on the IDU and a voice warning that repeats until acknowledged by the pilot. Cautions consist of an amber flag on the IDU and a one-time voice report or high/low-tone warble. Advisories can consist of an amber or green flag depending on condition, and a single voice report or warble.

The EFIS installation consists of at least one IDU permanently assigned as the PFD and up to three additional IDUs assigned as PFD/MFD, up to two Air Data Computers (ADC), up to two Global Positioning System (GPS) receivers, up to two Attitude and Heading Reference Systems (AHRS) units, and an Analog Interface Unit (AIU) with reversionary switching as needed.

A "for Navigation Only" EFIS installation consists of a single IDU that can alternate between PFD and MFD, an ADC, a GPS receiver, an AHRS unit, and an optional AIU. This installation requires that the traditional flight instruments be installed within the primary view of the pilot.

Each IDU contains all necessary hardware, software, and databases and operate independently of the other IDUs installed. The IDU consists of a high-brightness backlit Active Matrix Liquid Crystal Display (AMLCD) screen, eight menu buttons, a selection/enter encoder, a display brightness encoder, and an optional slip indicator. The buttons, control knobs, and optional slip indicator are backlit and adjustable by the brightness encoder. These may also be controlled by the cockpit master dimming control, depending on the installation.

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REMOTE SENSORS

The Crossbow Technologies AHRS500GA AHRS unit provides attitude and heading reference to the EFIS. The AHRS500GA employs three, solid-state angular-rate sensors, three solid-state accelerometers, and three fluxgate magnetometers encased in a single sealed, all-metal housing that is isolated from external shock and vibration. The internal power supply provides 250 ms of standby power in case of a momentary power interruption.

The FreeFlight Systems Wide Area Augmentation System-Global Positioning Sensor (WAAS-GPS) provides GPS data for aircraft, navigation, obstruction, and terrain data in a self contained unit. The WAAS-GPS consists of an antenna mounted on top of the airframe, and a Sensor/Processor Unit (SPU) located remotely in the avionics area.

The Shadin 2000 ADC provides airspeed, altitude, fuel flow, and Outside Air Temperature (OAT) for processing in the EFIS. The ADC is a self-contained remote mounted unit that receives its input from the aircraft's pitot-static system.

The optional Chelton Flight Systems AIU is a remote mounted unit that converts analog signals from a radar altimeter, an ADF receiver, flight director, marker beacon, and up to two Nav/GS receivers for processing in the EFIS. The AIU transmits vertical and lateral commands from the EFIS for autopilot control.

A complete description of the functions of the EFIS is contained in the Chelton FlightLogic EFIS Pilot's Operating Guide and Reference, Doc. No. 150-045240.

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Figure 1: PRIMARY FLIGHT DISPLAY



Figure 2: MULTIFUNCTIONAL DISPLAY

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2.0 LIMITATIONS

2.1 GENERAL

- A. The Chelton Flight System FlightLogic EFIS Pilot's Operating Guide and Reference, Document No. 150-045240, Revision A, dated 12/20/02 (or later approved revision) must be immediately available to the pilots. The software version stated on the pilot's manual must match that displayed on the equipment.
- B. The Chelton Flight System EFIS II must utilize software version:

Chelton IDU - Software version 4.0F-10 or later FAA approved revision
- C. Before engine start, verify EFIS system is OFF. Low voltage can cause erroneous initialization of the Attitude Heading Reference System.
- D. The airplane must be stationary during and for 45 seconds after power up. This allows the Attitude Heading Reference System to initialize.
- E. For IFR operation, the EFIS system must include a Primary Flight Display and one or more Navigation displays. For IFR operations with only one display, traditional flight instruments shall be installed within the primary view of the pilot.

2.2 NAVIGATION

- A. IFR en route, terminal, and Instrument approach navigation predicated upon the Chelton FlightLogic EFIS is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.
- B. Instrument approach navigation must be accomplished in accordance with the approved instrument approach procedures. These procedures shall be retrieved from the EFIS navigational database. Note: Before conducting an instrument procedure, the procedure should be verified by reference to current approved data.
- C. Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay is not authorized. Approved approaches are noted by an asterisk (*) before the approach procedure label.

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For example, to select an approach in to Runway 8 at Juneau airport the following options are available:

*NDB08

LDA08

(The approved approach is the NDB08)

- D. WAAS or Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix to continue the approach.
- E. During a Non-Precision Approach, the primary instruments are the Course Deviation Indicator (CDI) and the Altimeter. The Skyway provides reference to the approach path and a stabilized approach path from the Final Approach Fix (FAF) altitude to the Missed Approach Point (MAP) reference altitude. The Skyway will descend below the Minimum Descent Altitude. The Altimeter must be used to maintain the appropriate altitudes during the approach procedure.

2.3 TERRAIN WARNING

- A. Navigation and Terrain Separation must not be predicated upon the use of the terrain function.

NOTE: The terrain display is intended to serve as a situational awareness tool only. It may not provide either the accuracy or fidelity, or both, on which to solely base decisions and plan maneuvers to avoid terrain or obstacles.

- B. To avoid unwanted alerts, the TAWS must be inhibited when landing at a landing site that is not included in the airport database or when an approach has not been selected.
- C. Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with TAWS warnings.

3.0 EMERGENCY/ABNORMAL PROCEDURES

3.1 EMERGENCY PROCEDURES

- A. In the event of a failure of pilot IDU's, secondary flight instruments or Standby Instrument (whichever is installed) will be utilized to complete the current flight and the faulted units must be replaced/repared before further flight.

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B. OPTIONAL AUTO-SWITCHING TO BATTERY BUS:

In the event of an electrical power failure, the EFIS II system will be automatically switched to the aircraft battery bus. The “ON BATT” (amber) annunciator will illuminate indicating that the EFIS II system is on the aircraft battery.

C. OPTIONAL DEDICATED BATTERY INSTALLED:

In the event of an electrical power failure, a dedicated battery will automatically supply electrical power to the EFIS II system. The “BATT ARM” (white) annunciator will extinguisher and the “BATT ON” (amber) annunciator will illuminate indicating that the EFIS II system is on the dedicated battery. The dedicated battery will support the pilot’s EFIS II system for a minimum of one hour.

3.2 ABNORMAL PROCEDURES

The FlightLogic EFIS provides reversionary modes in the event of component failures, attitude failure or heading failure. The following sections detail these procedures.

A. IDU FAILURE

In the event of a failure of the Pilot’s/Co-pilot’s Primary Flight Display (PFD) – Press the lower right hand knob on the Multifunction Display (MFD) to display the primary flight instruments on the MFD.

B. PILOT’S ATTITUDE/HEADING FAILURE

In the event of the loss of attitude and heading information on the Primary Flight Display (PFD) -Refer to the stand by Attitude Instrument for airplane attitude information. The EFIS will continue to display ground track which may be used in lieu of heading.

C. GPS FAILURE

GPS failure causes the EFIS to lose updating of aircraft position, ground speed and ground track, and the ability to calculate wind information. In this condition, the EFIS operates in “dead reckoning” mode and continues to provide navigational position, groundspeed, and ground track information based upon the last known wind and current air data and heading. A “NO GPS” caution flag is displayed and a “GPS failure. GPS failure” voice annunciation is announced.

In the event of the loss of GPS -Revert to navigation based on dead reckoning or ground-based navigational equipment.

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D. AIR DATA INFORMATION FAILURE

In the event of the loss of air data information (Airspeed and Altitude) on the Primary Flight Display (PFD) -Refer to backup Airspeed and Altitude Instruments.

Failure of the GPS, AHRS or ADC, singly or in combination, adversely impacts the capabilities of the IDU. Failure of these components is annunciated visually and audibly. In addition, the IDU software provides reversionary modes to show as much useful and accurate information as possible in light of the failure condition. For "Multiple Sensor Failure" conditions refer to Chelton Pilots Operating and Reference Manual document No. 150-045240.

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4.0 NORMAL PROCEDURES

4.1 POWER UP and SELF TEST

- Apply power to the IDU by applying aircraft power and placing the EFIS I (II) Master Switch(s) in the ON position.
- System will perform an automatic Self-Test. Passing is indicated by a "Push any Key to Continue" screen. At this time verify that the databases are current. Failure is indicated by a "Bios error," "system not found," blank screen, screen with no image, continual screen resetting (booting) or a "CRC error."

4.2 OPERATION

Normal operating procedures are outlined in Chelton Flight Systems FlightLogic EFIS Pilots Operating Guide and Reference Doc. No. 150-045240 Section 5, "Step-by-Step Procedures."

4.3 DISPLAY ANNUNCIATION / MESSAGES

Caution / Warning / Advisory System is outlined in Chelton Flight Systems FlightLogic EFIS Pilots Operating Guide and Reference Doc. No. 150-045240 Section 2, "System Overview."

4.4 SYSTEM ANNUNCIATORS /SWITCHING

NOTE: Actual switches installed are dependent on aircraft configuration

A. EFIS MASTER SWITCH

The EFIS 1 Master Switch is a 2-position toggle switch located on the Pilot's instrument panel.

B. "ON BATT" ANNUNCIATOR

In the event of an electrical power failure, the EFIS will be automatically switched to the aircraft battery bus. The "ON BATT" (amber) annunciator will illuminate indicating that the EFIS system is on the aircraft battery.

C. "BATT ON / BATT ARM" ANNUNCIATOR

In the event of an electrical power failure, an optional dedicated battery will automatically supply electrical power to the EFIS II system. The "BATT ARM" (white) annunciator will extinguish and the "BATT ON" (amber) annunciator will illuminate indicating that the EFIS II system is on the dedicated battery.

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D. TAWS INHIBIT ANNUNCIATOR SWITCH

The “TAWS INHIBIT” (Amber) annunciator switch, when activated, illuminates and inhibits the visual and audible TAWS alerting functions. The “TAWS INHIBIT” annunciator switch is located near the EFIS displays.

E. AUDIO MUTE SWITCH

The Audio Mute Switch located on the Pilot’s control wheel mutes EFIS System active voice alerts.

F. SENSOR SELECT ANNUNCIATOR SWITCHES (Dual Sensor Installations Only)

A Sensor Select annunciator switch for each dual sensor installation is located near the pilot’s EFIS. A separate toggle switch is used for each sensor type (i.e. GPS, ADC, AHRS). When the number 1 sensor is selected, the toggle switch is in the up position. When the number 2 sensor is selected, the toggle switch is in the down position.

5.0 PERFORMANCE

No Change